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*A Full Service Motion Control Distributor and Systems Integrator.*

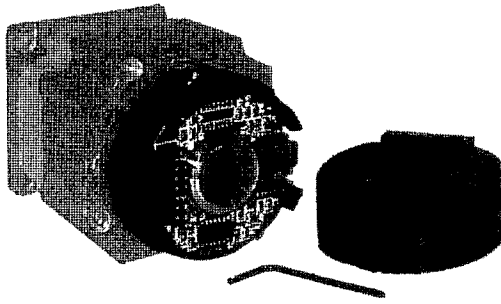
**Servo Motor w/Tachometer**  
P/N: WGYMN-4200  
Servo Systems Co. Stock # DM691

**Motor Leads**

14awg Red	+Voltage
Black	Common

**Tach Leads**

24awg Red	+
Black	Common
Green/Yellow	Case Ground



Shown installed on Size 23 (2.3") servo motor

- **Modular, Incremental Encoder for Stepper and Small Servo Motor Feedback**
- **Phased Array Sensor Technology Provides High Temperature and Operating Frequency and Allows 0.020" (0.5 mm) of Axial Play**
- **Resolutions to 2048 PPR with Index Standard; Optional 4, 6, or 8 Pole Commutation Tracks for Brushless Servo Motors**
- **Easy Installation and Removal without Special Tools or Parts**

The Dynapar brand M21 modular encoder provides high-performance, cost effective feedback for stepper and servo motor controls. Using industry standard package dimensions, the M21 is easily installed onto the motor without time-consuming adjustments or special tools. Its unique mechanical design automatically centers and gaps the disc during installation.

For Brushless DC (BLDC) servo control, optional 3 phase commutation tracks replace the traditional Hall Effect sensors. These optically-generated signals provide higher accuracy and reliability, improving the performance and reliability of the servo system.

**Dynapar Exclusive:** The M21 design operates up to 120°C. The high temperature plastics, phased array sensor, and low current requirements stabilize the output signals over a wide range of input voltage, ambient temperature, or output frequencies.

**Dynapar Exclusive:** The M21 provides 30 degrees of adjustment to align the signal outputs to the shaft position. Using an industry standard Size 21 modular mounting pattern, the index mark on the disc hub can be coarse aligned to the index sensor position on the housing. The housing rotates to allow further adjustment of the index or fine alignment of the commutation channels to the BLDC motor windings.

**Dynapar Exclusive:** The M21 enclosure is dirt-tight, rated NEMA 1 / IP50. The cover is gasketed to seal the disc and optics from contamination. Additionally, the base can be sealed to the motor for further environmental protection.

**Dynapar Exclusive:** The M21 outputs are protected from short circuits, and operate on 5 or 12 VDC power.

## SPECIFICATIONS

### Electrical

**Code:** Incremental

**Resolution:** (pulses/revolution)  
Incremental: 500 to 2048 PPR  
Commutation: 2, 3, or 4 PPR

**Accuracy:**  
Incremental:  $\pm 5$  arc-mins. max. edge to edge;  
Commutation:  $\pm 6$  arc-mins. max.

**Sense:** (viewing encoder mounting surface)  
Incremental: A leads B by 90° for CCW rotation of motor shaft;  
Commutation: U leads V, V leads W by 120° for CW rotation of motor shaft

**Phasing:**  
Incremental: 90°  $\pm 18^\circ$  electrical  
Commutation: 8 Pole: 30°; 6 Pole: 40°; 4 Pole: 60° mechanical  
Index to U Channel:  $\pm 1^\circ$  mechanical - Index center to U channel edge

**Symmetry:**  
Incremental: 180°  $\pm 18^\circ$  electrical  
Commutation: 8 Pole: 45°;  
6 Pole: 60°; 4 Pole: 90° mechanical  
**Index Pulse Width:** 180°  $\pm 36^\circ$  electrical  
(Gated with B low) standard

**Input Power Requirements:**  
Incremental: 5 or 12 VDC  $\pm 10\%$  at 100 mA max. (excluding output load);  
Commutation: 5 or 12 VDC  $\pm 10\%$  at 75 mA max. (excluding output load)

**Output Signals:**  
ET7272 Line Driver: 40 mA sink/source max.;  
Open Collector w/2.0 k $\Omega$  pull-ups: 16 mA sink max.

**Frequency Response:** 200 kHz min.

**Termination:**  
Connector: PCB mounted dual row head with 0.1" x 0.1" pin spacing, 10 pins (incremental only), 16 pins (w/commutation);  
Cable: conductors - 28 AWG, stranded (7/36), insulation - black, PVC; Shield: aluminum/polyester foil plus tinned, copper drain wire (28 AWG, 7/36)

**Noise Immunity:** Conforms to EN50082-1  
Light Industrial for Electro-Static Discharge, Radio Frequency Interference, Electrical Fast Transients, Conducted Interference, and Magnetic Fields (for models or applications with shielded cable)

### Mechanical

#### **Weight:**

Connector: 1 oz. (28 gm) typ.  
Connector w/cover: 1.5 oz. (43 gm) typ.  
Cable: 2.5 oz (71 gm) typ.  
Cable w/cover: 3 oz. (85 gm) typ.

#### **Dimensions:**

Outside Diameter: 2.1" (53 mm) max. w/cover, 2.0" (51 mm) max. without cover;  
Height: 0.8" (20.3 mm) max. (w/cover, excluding connector);  
Emitter to Detector Gap: 0.070" (1.8 mm) min.

#### **Material:**

Base, Housing, & Cover: high temperature, glass filled polymer;  
Hub: Aluminum; Disk: 0.030" thick glass

#### **Finish:**

Base & Housing: black;  
Cover: RAL 7010 (dark grey)

**Moment of Inertia:** 6.64 x 10<sup>-5</sup> in-oz sec.<sup>2</sup> (4.7 gm-cm<sup>2</sup>)

**Hub Diameters:** 1/4", 3/8", 7/16", 1/2", 6 mm, 8 mm, 10 mm, 12 mm nominal

**Hub Dia. Tolerance:** +0.001"/-0.000" (+0.026 mm/-0.000 mm)

**Mating Shaft Length:** 0.45" (12 mm) min. blind hub clamp screw, 0.65" (16.5 mm) exposed hub clamp screw; 0.75" (19 mm) max. inside cover

**Mating Shaft Runout:** 0.002" (0.05 mm) max. (Includes shaft perpendicularity to mounting surface)

**Mating Shaft Endplay:** +0.005"/-0.015" (+0.13 mm/-0.38 mm) nominal ("+" indicates away from mounting face)

#### **Mounting:**

Base: (2) #4-40 (M2.5) #1 Phillips fillister head cap screw on 1.812" (46 mm) B.C., 0.01" (0.254 mm) true position to shaft;  
Shaft: split hub w/collar clamp, #2-56 hex socket cap screw (5/64" hex wrench included)

**Electrical/Mechanical Alignment Range:**  $\pm 15^\circ$  mechanical

**Acceleration:** 100,000 rad/sec.<sup>2</sup> max.

**Velocity:** 12,000 RPM max.

### Environmental

**Operating Temperature:** -40° to 120°C

**Storage Temperature:** -40° to 85°C

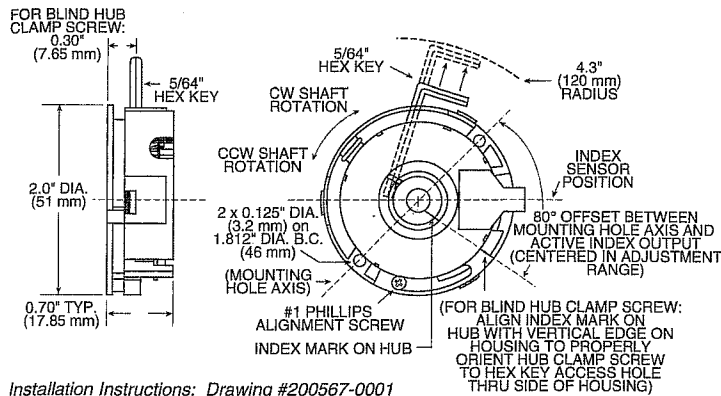
**Shock:** 50 G's for 11 msec duration

**Vibration:** 2.5 G's at 5 to 2000 Hz

**Relative Humidity:** 90% non-condensing

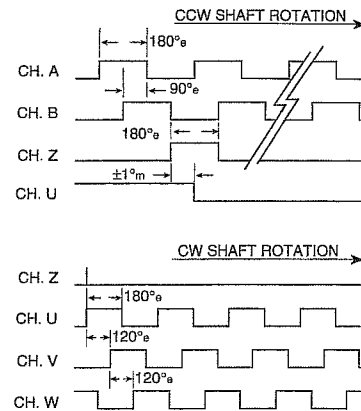
**Enclosure Rating:** NEMA 1 / IP50 dirt-tight (for models with cover)

## Dimensions/Installation



Installation Instructions: Drawing #200567-0001  
Alignment Instructions: Drawing #200567-0002

## Output Waveforms (For clarity, compliments are not shown.)



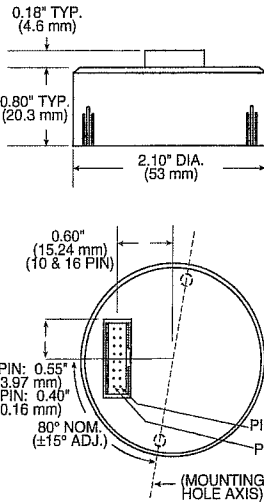
## Code 6: Terminations (Not all signals present on all models)

0: Pin Header

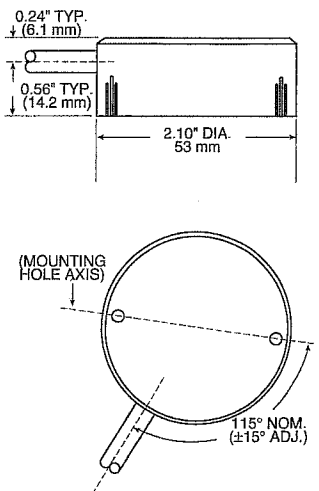
1-8: Ribbon Cable

A-H: Shielded Cable

Pin	O.C.	L.D.	16 Pin
1	A	—	Vcc com
2	Vcc	Vcc	Vcc Inc
3	GND	GND	GND Inc
4	—	—	GND com
5	—	A'	A'
6	—	A	A
7	—	B'	B'
8	B	B	B
9	—	Z'	Z'
10	Z	Z	Z
11	—	—	U'
12	—	—	U
13	—	—	V'
14	—	—	V
15	—	—	W'
16	—	—	W



Function	Wire Color	Incr. Only	Incr. & Comm.
Vcc com	—	RED/WHT	RED
Vcc Inc	RED	RED	RED
GND Inc	BLK	BLK	BLK
GND com	—	BLK/WHT	BLK
A'	RED/BLK	BLU/BLK	BLU/BLK
A	GRN	BLU	BLU
B'	WHT/BLK	GRN/BLK	GRN/BLK
B	ORN	GRN	GRN
Z'	BLU	VIO/BLK	VIO/BLK
Z	WHT	VIO	VIO
U'	—	BRN/BLK	BRN/BLK
U	—	BRN	BRN
V'	—	GRY/BLK	GRY/BLK
V	—	GRY	GRY
W'	—	WHT/BLK	WHT/BLK
W	—	WHT	WHT



## Ordering Information

To order, complete the model number with code numbers from the table below:

Code 1: Model		Code 2: PPR, Poles		Code 3: Cover		Code 4: Electrical		Code 5: Hub		Code 6: Termination	
M21		□□□□/□		□		□		□		□	
Ordering Information											
M21	Size 20 Commutating Modular	Incremental channels only		0 No cover  1 Enclosed, end-of-shaft mount  2 Through shaft	0 5V in, open collector out incremental only  1 12V in, open collector out incremental only  3 5V in, line driver out incremental only   Available when Code 2 is XXXX/4, XXXX/6, or XXXX/8  6 5V in, line driver out incr.; 5V in, open collector out comm.  7 5V in, line driver out incr.; 12V in, open collector out comm.  9 5V in, line driver out incr.; 5V in, line driver out comm.	Blind hub clamp screw:		0 Pin Header  1-8 Mating ribbon cable included; 1=1 ft., 2=2 ft., etc.   Available when Code 4 is 3 or higher:  A-H Shielded cable; A=1 ft., B=2 ft., etc.			
		0500/0	2000/0			0 1/4 in.					
		1000/0	2048/0			1 3/8 in.					
		1024/0				2 7/16 in.					
						3 1/2 in.					
						4 6 mm					
						5 8 mm					
						6 10 mm					
						7 12 mm					
						Exposed hub clamp screw:					
		A 1/4 in.									
		B 3/8 in.									
		C 7/16 in.									
		D 1/2 in.									
		E 6 mm									
		F 8 mm									
		G 10 mm									
		H 12 mm									
		Incremental plus Commutation channels									
		0500/4	1024/4								
		0500/6	1024/6								
		0500/8	1024/8								
		0512/8	2000/4								
			2000/6								
		1000/4	2000/8								
		1000/6									
		1000/8	2048/4								
			2048/6								
			2048/8								